

WHITE PAPER

## THE EVOLUTION OF THE CALIFORNIA ENERGY MARKET.

How Demand Response and Demand Management will play integral roles in the Golden State's energy future.

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How Demand Response and Demand Management  
Will Play Integral Roles in The Golden State's Energy Future.

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For decades, California has been at the forefront of energy’s evolution, leading the exploration of new ideas on the distribution and use of energy in the US.

California innovation has driven the evolution of our nation’s energy mix from the finite sources that dominated the 20th century to the renewables that are poised to fuel our world for the 21st century and beyond.

Our state’s drive to a sustainable future has California in position to achieve the goals of The California Global Warming Solutions Act and the Renewable Portfolio Standards (RPS), two of the most ambitious energy initiatives in the US. Achieving the goals of these programs, which we’ll discuss in detail later in this paper, involves changing the way we procure, distribute, and use energy in California.

To say a lot has been written and opined about the Golden State’s renewable energy pursuits would be like saying our American president authors the occasional incendiary Tweet—a gross understatement. Relatively few of the myriad energy expert opinions, however, have offered specific insight on how demand response and demand management will contribute to California’s energy evolution.

This paper aims to present a clear picture of the integral roles demand response and demand management will play as California leads our nation’s push toward a sustainable energy future.

We’ll discuss how our state’s largest electric utilities (SCE, PG&E, SDG&E) and California’s grid operator (CAISO) have evolved demand response in the Golden State to maintain the flow of reliable electricity to the areas that need it most.

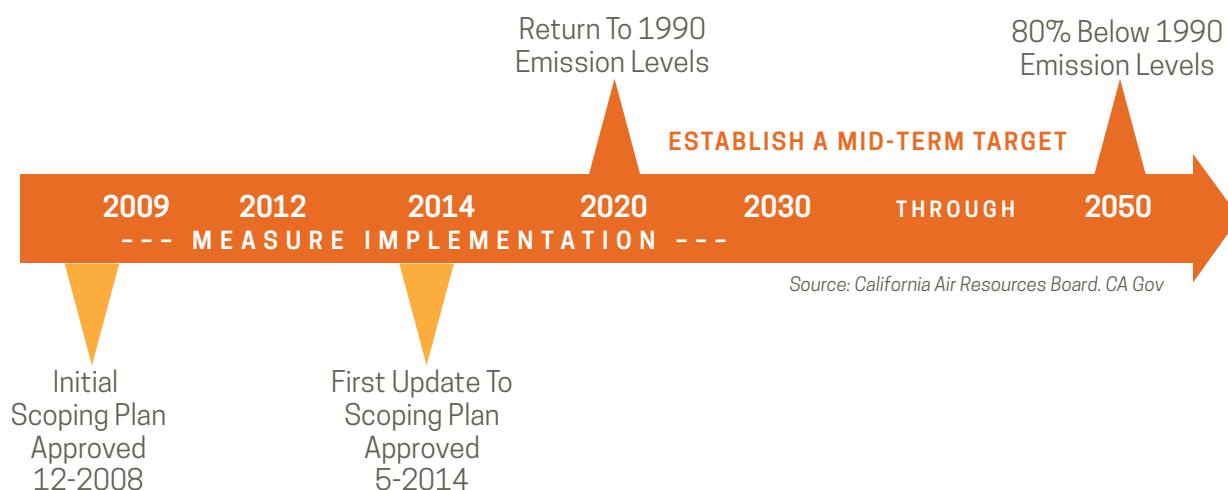
We’ll also examine how demand management practices are combining with distributed resources like energy storage to help alleviate grid stress and curb volatile electricity prices.

Most importantly, we’ll paint a clear picture of the future and present of California’s energy landscape in a way that arms organizations and businesses with the facts and insights needed to make sound energy management decisions.

# THE CALIFORNIA GLOBAL WARMING SOLUTIONS ACT: ASSEMBLY BILL 32

Assembly Bill 32 requires California to reduce its greenhouse gas (GHG) emissions to 1990 levels by 2020. Passed in 2006, the bill marked what proponents tout as a “watershed moment in California’s history.” AB 32 was the first program in the US to offer a long-term approach to address climate change. It aims to improve the environment while maintaining a robust economy.

## PATH TO 2020 AND BEYOND



Under AB 32, the California Air Resources Board (CARB) developed regulatory and market mechanisms to achieve quantifiable and cost-effective GHG reductions, making California the first U.S. state to adopt comprehensive GHG emission reduction strategies covering all economic sectors.

AB 32 includes four primary programs, each of which is geared toward improved energy efficiency:

- Advanced Clean Cars
- The Renewables Portfolio Standard
- The Low Carbon Fuel Standard
- Cap and Trade

California is on target for meeting the 2020 GHG emission reduction goal. Reaching the goals established in AB 32 means California will have reduced emissions by approximately 15% compared with what “business as usual” might have yielded in 2020.

<sup>1</sup>California Air Resources Board Assembly Bill 32 Overview: [CA.gov](http://CA.gov)

<sup>2</sup>Ibid

<sup>3</sup>California Air Resources Board Scoping Plan

### What does this mean to you?

California has challenged itself to meet the loftiest energy goals of any state in the country. The Golden State is taking a leadership position in showing the rest of the country how to evolve its energy grid into the future.

## THE RENEWABLE PORTFOLIO STANDARDS (RPS)

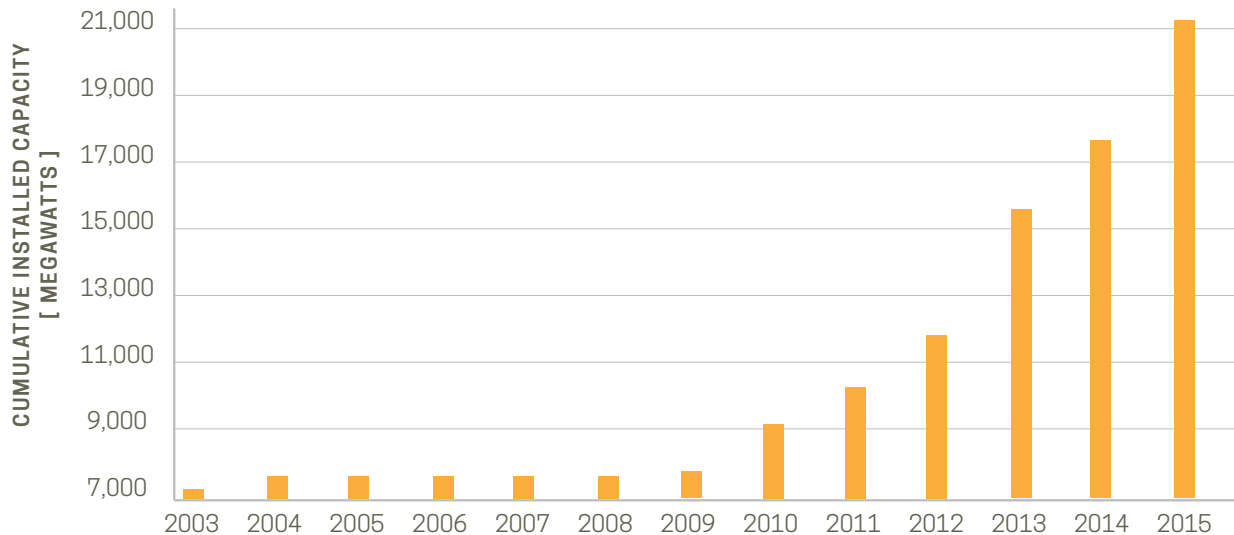
Created in 2002 under [Senate Bill 1078](#) and since accelerated under subsequent bills, California's Renewable Portfolio Standards (RPS) is a market-based policy requiring utilities to deliver 50% of their retail electricity from clean, renewable sources by 2030.

The RPS is the primary vehicle for new utility-scale renewable energy development in the state. It requires retail sellers, investor-owned utilities (IOUs), electric service providers (ESPs) and community choice aggregators (CCAs)—all of which are regulated by the California Public Utilities Commission (CPUC)—to procure their annual retail sales from eligible renewable sources as follows:

- 33% by end of 2020.
- 40% by 2024
- 45% by 2027
- 50% by the end of 2030

Since the RPS's creation, installed renewable generation capacity in California has tripled (See figure below).

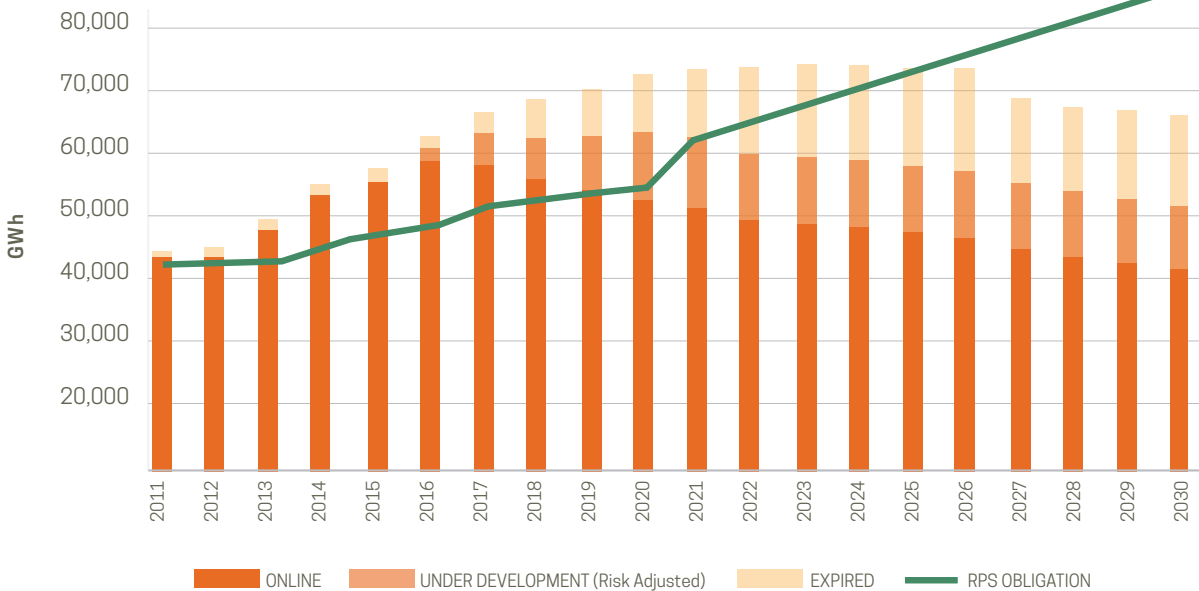
## IN-STATE RENEWABLE GENERATION CAPACITY 2003-2015



<sup>4</sup>Ibid *Source: California Energy Commission, Data Through June 30, 2015*  
California's three large IOUs— Pacific Gas and Electric Company (PG&E), Southern California Edison Company (SCE), and San Diego Gas & Electric Company (SDG&E)—provide approximately 68% of the state's electric retail sales. According to the RPS Standard 2016 4th QTR Report, California's investor-owned utilities are on track to meet their RPS requirements.

Since 2003, 15,565 MW of renewable capacity in California achieved commercial operation under the RPS program. In 2016, 2,973 MW of renewable capacity reached commercial operation. An additional 1,045 MW of renewable capacity is forecasted to achieve commercial operation in 2017.

## IOU PROGRESS TOWARDS 50% RENEWABLES ACTUAL AND FORECASTED BY YEAR



Source: Renewables Portfolio Standard Quarterly Report, California Public Utilities Commission—4th Quarter 2016

### What does this mean to you?

Despite its lofty ambitions, California's RPS is tracking toward its ultimate goal of utilities and all of the state's load serving entities delivering at least 50% of their retail electricity by 2030. The RPS is not the only world-leading energy policy California is currently implementing in its pursuit of integrating renewable energy into the electric grid at a massive scale. The California Solar Initiative (CSI) and Energy Storage Mandate are also guiding our state to a greener energy future. Currently, California leads the nation in distributed energy generation, with more than 680,000 solar projects contributing to more than 5,400 Megawatts (MW) installed. California is also the largest US market for behind-the-meter energy storage.

<sup>6</sup>Ibid. (page 5)

<sup>7</sup>California Distributed Generation Statistics—<http://californiadgstats.ca.gov/> (data updated April 30, 2017)

<sup>8</sup>Demand Response in North American Wholesale Markets—Bloomberg New Energy Finance (pg 13)

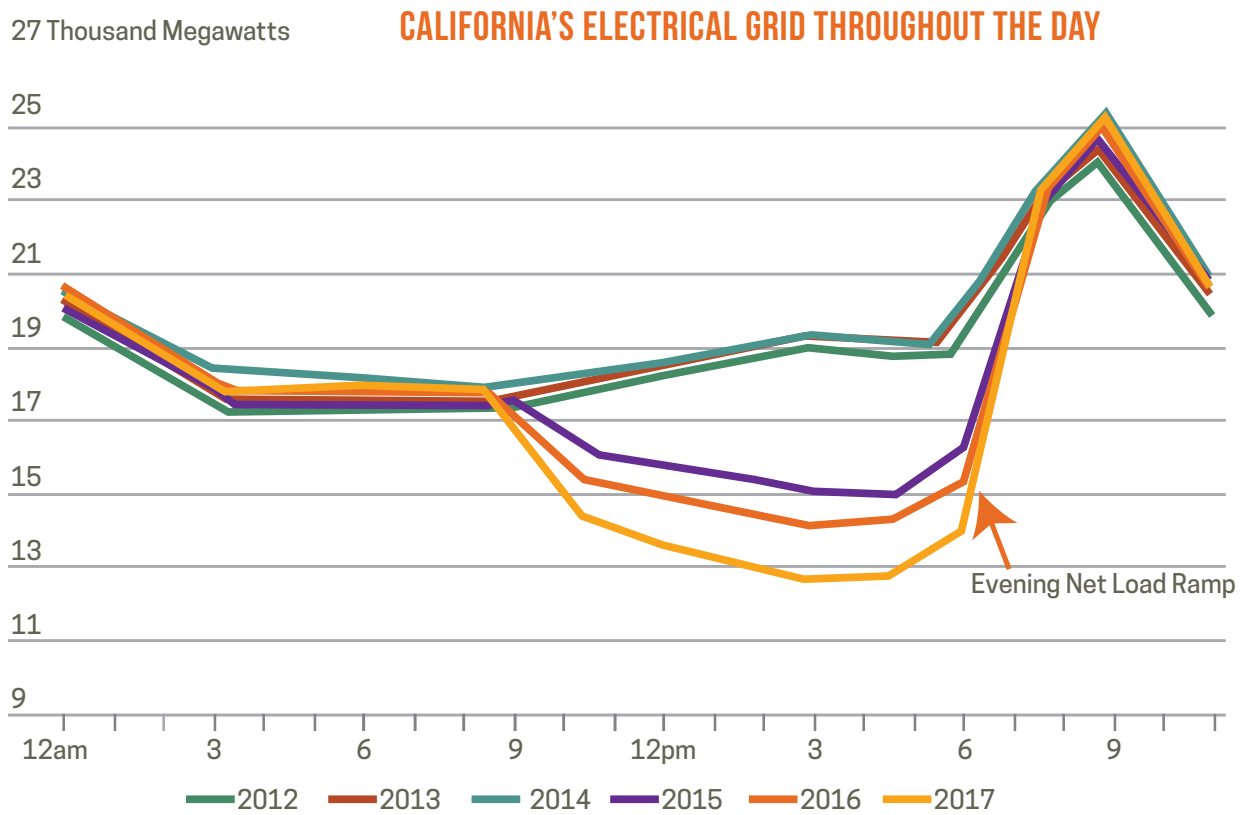
# RELIABILITY CONCERNS IN CALIFORNIA

California's leading approach to alternative energy has the state in a position to achieve the ambitious goals of its energy initiatives. The Golden State's drive for renewable energy, however, has created reliability concerns for the state's electrical grid.

## The "Duck Curve"

Evidence of these challenges can be found in the phenomenon known as the "Duck Curve," whereby the state experiences a daily spike in energy demand in the early evening when renewable energy sources like solar go offline and residents come home from work and increase their energy consumption by flipping on their air conditioning, turning on their lighting, doing laundry, charging electronic devices, and other daily activities.

The result is a need for other energy resources (like gas-fired peaking units) to fill the gap during the evening when the California grid is at its most fragile point.



## ALISO CANYON'S LINGERING EFFECT ON CALIFORNIA'S SUPPLY

In October 2015, Aliso Canyon—the largest natural gas storage facility in California—suffered a leak in the LA Basin/Porter Ranch area, resulting in the emission of more than 97,000 metric tons of methane. To put the tonnage in perspective, the leak produced enough methane gas each day to fill a balloon the size of the Rose Bowl. The leak was plugged after 112 days.

The fallout has proven costly for the natural gas infrastructure in Southern California. According to the [“Aliso Canyon Risk Assessment Technical Report,”](#) the leak reduced Aliso Canyon’s gas stores to less than 20% of its capacity.

Nearly two years later, the effects from the leak still linger. The Federal Energy Regulatory Commission’s (FERC) [Summer 2017 Energy Market and Reliability Assessment](#) indicated that while the state’s overall power supplies remain robust, there are still lingering concerns about the effects of the Aliso Canyon gas leak in Southern California.

FERC’s assessment expressed concern that diminished natural gas supplies from the Aliso facility, the largest in the state, could lead to reliability issues if California experienced an especially hot summer in 2017. It was, in fact, a scorcher this summer in California and several demand response events were called to maintain reliability in the state.

### What does this mean to you?

No electrical grid is without its sporadic bouts with volatile electricity prices or imbalances between the supply of and demand for energy. In California’s case, the daily potential for both rising prices and grid instability is due, in part, to our state’s aggressive pursuit of renewable energy sources.

What the “Duck Curve” demonstrates is that there is a need for other carbon-neutral energy resources to fill the evening gap when demand on the grid spikes, which can cause both high prices and an imbalance between supply and demand, particularly on exceedingly hot days.

Demand response and energy storage, two distributed energy resources that have evolved significantly to meet the needs of California’s changing energy landscape, may be the answer. This past summer, demand response was called on several times to keep the CAISO grid balanced, proving DR to be a distributed resource grid operators can count on in a pinch.

# DEMAND RESPONSE IN CALIFORNIA

For most of the last two decades, demand response in California has been largely procured and operated by the state's electric utilities. That trend is changing.

Demand response in California is currently experiencing significant changes as regulators implement measures to expand the state's pool of energy resources and assimilate these resources with the California Independent System Operator's (CAISO) markets.

This regulatory reform has created new opportunities for demand response and other distributed energy resources.

## The Demand Response Auction Mechanism

The Demand Response Auction Mechanism (DRAM) was developed in 2014 under the guidance of the California Public Utility Commission (CPUC) in an effort to harmonize utility-based reliability demand response with CAISO, the state's grid operator.

In December 2014, the Commission issued D. 14-12-024 which requires the state's IOUs: Southern California Edison Company (SCE), San Diego Gas & Electric Company (SDG&E) and Pacific Gas and Electric Company (PG&E) to design and implement Demand Response Auction Mechanism (DRAM) pilot programs in 2015 for 2016 capacity (DRAM I or 2015 DRAM) and in 2016 for 2017 capacity (DRAM II or 2017 DRAM). The three utilities recently completed a solicitation for 2018/2019 capacity (DRAM III) procuring over 200 MW of DR resources across the state.

Now in its third year, the program seeks to allow CAISO to add reliable demand response resources to areas of California where electric reliability may be at risk.

DRAM is a pay-as-bid program with three goals:

- 1) Fully integrate DR resources with the CAISO energy market
- 2) Test whether third parties can bring these resources to the table without structured utility programs
- 3) Allow residential resources to participate directly in the CAISO markets

The DRAM program also provides market participation testing from a broader base of distributed energy resources, including behind-the-meter storage. Under DRAM, these resources have the opportunity to behave not just as system capacity, but also as local and flexible resources.

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<sup>9</sup> Demand Response in North American Wholesale Markets, James Sprinz, Bloomberg New Energy Finance  
—May 11, 2017

## The Local Capacity Requirement (LCR) Program

To add local capacity in the constrained West LA Basin and to enable increased clean and renewable energy supply, Southern California Edison (SCE) introduced in late 2016 the Local Capacity Requirements (LCR) program.

The primary purpose of the LCR program is to help support the local West LA grid when it is under high demand for power, ensuring reliability and affordable energy prices.

The program is a long-term plan to bring roughly 2,200 MWs of grid resources on-line by 2022 to help the LA and Orange county regions make up for the 2013 closure of the San Onofre nuclear power plant.

The LCR program is unique in California in that it encourages the combination of energy storage and demand response resources to achieve its capacity goals.



## Complementing Demand Response with Demand Management

California is investigating other ways consumers can contribute to grid resilience through demand management. The CPUC and CAISO are exploring programs and products that would allow customers to shift their electrical loads from the evening to the middle of the day, allowing for more consumption of electricity at a time when the grid produces an abundance of solar resources. Enough of a shift in load could help flatten the duck curve.

Additionally, rate changes as well as programs that pay customers to provide EV services or to charge a solar device may be introduced to allow broader demand management services to potentially play a role in California's grid future.

### What does this mean to you?

Demand response in California is evolving. While the process of expanding DR resources and assimilating them with CAISO markets is incremental, it's clear DR is poised to play a key role in bridging the California energy market from its present state to the future.

Because demand response programs pay businesses for using less energy when the grid is stressed or when electricity prices are high, they are a good fit for commercial and industrial organizations looking to offset their total energy spends with new revenue streams.

Energy storage, long hailed as a market game-changer whose high cost and diminished practicality made it a resource that was always a few years away from massive integration, has also evolved and is ready to help California achieve its sustainability goals. With the advent of programs such as the Local Capacity Requirements (LCR) program, storage is set to pair with demand response to provide needed capacity in regions of California that are susceptible to grid instability.

# CONCLUSION

California is at the forefront of energy’s evolution. Our drive toward generating 100% of our state’s energy by way of renewable sources by the middle of this century is one no other state can match. Getting there won’t be easy, but the road of a pioneer seldom is.

The state’s recent actions aimed to revise the California market’s existing demand response program structure is an indication that DR has an important role to play in California’s future.

The best way for an organization to take advantage of the opportunities available in the California Market is to consult a trusted demand-side energy management company. Such a company can evaluate an organization’s facilities and determine its curtailment capabilities. Next, they can explain in full the many demand response and demand management programs that are available in the California Market and help determine which offer the particular organization the best chance for curtailment success.



**ABOUT THE AUTHOR:** Jennifer Chamberlin is CPower’s Executive Director for the California Market. She has spent 15+ years focusing on developing competitive energy markets through regulatory and government affairs, including advocating for demand response, behind the meter storage, and retail access with organizations such as LS Power, Direct Energy, Strategic Energy and Chevron Energy Solutions.



**ABOUT CPOWER:** CPower is a demand-side energy management company. We help our customers save on energy costs, earn revenue, increase grid reliability, and meet their sustainability goals. A leading provider of demand side management in the US, CPower serves more than 1,500 commercial, industrial, government, and non-profit customers nationwide. We have 25+ years of knowledge and experience in helping organizations implement energy management strategies backed by CPowered solutions.

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## References

- [California Energy Demand Continues Moderate Course](#), California Energy Commission—March 6, 2017
- [California Energy Demand Updated Forecast, 2017-2027](#), California Energy Commission, Feb. 2, 2017.
- [California's Demand Response 2.0 Creates New Competitive Markets](#), Jeff St. John for Greentech Media—March 11, 2015
- [The Details Behind California's Demand Response Auction Mechanism](#), Jeff St. John for Greentech Media—October 23, 2015
- [Prognosis negative: How California is dealing with below-zero power market prices](#), Herman K. Trabish—May 11, 2017
- [California ISO Market Performance and Planning Forum](#)—May 16, 2017
- Demand Response in North American Wholesale Markets, James Sprinz, Bloomberg New Energy Finance—May 11, 2017
- [California's Grid Faces an Existential Crisis. What Kind of Market Reforms Will Solve It?](#), Stephan Lacey—May 25, 2017
- [As California Mulls Retail Electricity Choice, Utilities Are Losing Customers in Droves](#) by Jeff St. John—May 17, 2017
- [Consumer and Retail Choice, the Role of the Utility, and an Evolving Regulatory Framework](#), California Public Utilities Commission—May 2017
- [Will California's 100% renewables goal survive the political process?](#), Herman K. Trabish—June 14, 2017
- [Renewables Portfolio Standard Quarterly Report](#), California Public Utilities Commission—4th Quarter 2016
- [Senate Bill No. 100, California Legislature](#) —January 11, 2017 (amended in Senate May 26, 2017)
- [Order Instituting Rulemaking to Enhance the Role of Demand Response in Meeting the State's Resource Planning Needs and Operational Requirements](#), California Public Utilities Commission —Dec. 9, 2014
- [Cheap natural gas pushes utilities towards more sophisticated demand-side management](#), Robert Walton—May 24, 2017
- [The U.S. Utility Demand Response Landscape: Programs, Case Studies and Economics](#), Elta Kolo—May 2017
- [2017 State of the Electric Utility Survey Report](#)
- [SCE Demand Response Programs Dual Enrollment Options \(2016\)](#)
- [Stem Becomes First Energy Storage Provider to Meet Crucial Reliability and Performance Requirements for Southern California Edison](#)
- [Southern California Edison Local Capacity Requirements \(LCR\)](#)
- [Summer 2017 Energy Market and Reliability Assessment, Federal Energy Regulatory Commission—June 2017](#)
- 2017 LOCAL CAPACITY TECHNICAL ANALYSIS —California ISO April 29, 2016
- 2016 Edition California GHG Emission Inventory  
[https://www.arb.ca.gov/cc/inventory/pubs/reports/2000\\_2014/ghg\\_inventory\\_trends\\_00-14\\_20160617.pdf](https://www.arb.ca.gov/cc/inventory/pubs/reports/2000_2014/ghg_inventory_trends_00-14_20160617.pdf)
- [How California lawmakers plan to align renewable generation with power demand](#) by Herman K. Trabish—March 30, 2017
- [Assembly Bill 32 Overview](#); CA.gov
- [California GHG Emission Inventory 2016 Edition](#), California Environmental Protection Agency Air Resources Board.
- [California Air Resources Board AB 32 Scoping Plan](#)
- [What California's heat wave revealed about demand response](#), Utility Dive article by Herman K. Trabish, Sept. 20, 2017